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AI-Powered Applications for Improving EFL Students' Speaking Proficiency in Higher Education

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ABSTRACT

As Artificial Intelligence systems increasingly dominate various sectors in this technology-driven era, educational institutions are eager to integrate innovative tools and applications into the teaching and learning experience to enhance students' abilities, performance, skills and achievements. This study aimed to examine the effectiveness of utilizing Google Assistant, an AI-based app, in improving students' English speaking performance. The research utilized a mixed-methods approach, combining both quantitative and qualitative data. Quantitatively, a pre-post speaking test was conducted with participating students before and after the intervention (using the Google Assistant app). Following the experiment, qualitative data were collected through focus group discussions with some of the participants. The findings revealed significant improvements in students' overall speaking performance and sub-skills. The use of the Google Assistant application notably enhanced EFL students' fluency and interaction, followed by pronunciation, vocabulary, content and relevance, and spoken grammar, respectively. Additionally, based on the participants' discussions, several benefits of using this AI-based application were identified, including providing language practice and resources, engaging and motivating learners, and immersing students in a self-directed learning experience. However, some challenges were also inducted, particularly regarding accessibility, connectivity and technical issues. Consequently, several conclusions and recommendations were drawn based on these findings.

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1. Introduction and Background

Artificial Intelligence (AI) is a multidisciplinary field that has gained significant attention in educational research [1–5]. AI technology involves the simulation of human cognitive processes by machines, including thinking, reasoning, planning, communicating, and predicting [6, 7]. The origins of AI trace back to the 1950s, with John McCarthy formally introducing the concept in 1956. Over time, AI has emerged as a critical academic field with significant implications for education, particularly in teaching, learning, and assessment [8, 9].

The adoption of AI in education has been increasingly attracting research interest from various perspectives, as it has the potential to support educational goals [10–12]. Multiple studies (e.g., [13, 14]) have demonstrated that AI technologies can address learners' needs, interests and independence. The integration of such tools has also been shown to positively impact learners' engagement and motivation, in addition to enabling personalized learning experiences and providing convenient feedback [15]. Rodrigues and Oliveira [16], for instance, examined the impact of formative feedback delivered by AI tools on students' learning, concluding that AI technologies are effective in evaluating students' progress. The implementation of AI tools in education has also led to the development of AI literacy [17, 18]. Additionally, smart tutoring systems, language processing, educational robots, and educational data mining (EDM) have been identified as major AI applications [19]. Recently, numerous AI-driven applications have been developed and utilized by educators across various educational levels and subject areas.

Artificial Intelligence (AI) has undergone various developmental phases, leading to the emergence of several specific domains, particularly Machine Learning (ML) and Deep Learning (DL) [20–22]. DL, a subset of ML, is considered one of the core components of AI technology. This evolution has given rise to numerous applications and tools, such as self-driving cars and virtual assistants like Siri, Alexa, and the Google Assistant Conversation Application [23].

The Google Assistant Conversation App is a modern application that emerged from the deep learning capabilities of AI technology. Its distinguishing feature is the ability to perform higher-level and multiple conversational tasks and comprehend words, analyze their meanings and make predictions [23, 24]. In essence, the invention of this conversational application represents a significant breakthrough in developing learners' verbal or spoken language skills. It provides learners of all ages, across various developmental stages, with effortless access to an unlimited range of expressions and words in different languages.

Speaking a language is a productive and complex skill that involves using verbal and non-verbal symbols to communicate and convey messages [25]. Verbal language is also defined as the oral use of language to deliver meaning or describe thoughts and feelings by articulating spoken words [26]. Besides, the oral production of language is described as an interactive process of producing and receiving information [27]. Developing learners' speaking performance is crucial for building their language proficiency, though it is often regarded as the most challenging skill due to its complexity, especially in learning English as a foreign language (EFL) [28].

The complexity of this skill can be attributed to multiple intertwined internal and external variables [26]. Therefore, developing spoken language is not merely about improving oral production; it involves constructing communication by producing utterances and processing information. In a sense, speaking performance encompasses various sub-skills, such as vocabulary, syntax and a range of linguistic, sociolinguistic and conversational abilities. Additionally, pronunciation, grammar, and vocabulary in addition to psycholinguistic and sociolinguistic aspects are considered the key components of this skill [27].

In higher education, developing EFL learners' spoken proficiency is crucial due to the marketplace demands that require institutions to equip undergraduate students with essential communication skills [28]. Enhancing EFL speaking performance can begin with structured conversations using simple questions presented in a contextualized and meaningful manner. This approach guides learners to engage in more creative dialogues and conversations [29]. Furthermore, language acquisition is significantly enhanced when learners are intensively exposed to the language in a meaningful con-

text[30]. In language instruction; moreover, English language educators need to utilize acquisition activities and materials, such as technological visual aids, to immerse language learners in an authentic context[31]. Therefore, applying various techniques and resources that enhance learners' speaking skill development has become vital to promoting their communication skills and overall language proficiency[29, 31, 32].

Given this context, it is no surprise that interest in investigating the adoption of AI tools in education and foreign language instruction has surged in recent years[2, 3, 33]. At Palestinian universities, teaching English as a foreign language is considered essential to prepare learners to navigate the vast amount of knowledge and information published in English as a lingua franca and to meet workplace demands that require foreign language proficiency, particularly in productive communicative skills[28]. As a result, university students across various disciplines often enroll in General English courses for academic purposes and in programs designed to enhance their English language competency.

As Palestinian instructors in the field of teaching English as a foreign language, the researchers have observed that many freshmen students enter Palestinian universities and colleges with deficiencies in their spoken language skills. This issue has become a significant obstacle to their academic success, as it can hinder their progress in courses delivered in English. Therefore, this study aimed to explore the use of one of the AI tools, the Google Assistant App, which has the potential to personalize the learning experience and develop EFL learners' linguistic and interaction skills[5, 34–36]. AI tools have been shown to enhance students' interaction, communication, and language learning through highly personalized and effective methods with fewer flaws[34, 37–39]. However, there have been limited studies investigating the impact of the Google Assistant Conversation App as a deep learning tool of AI technology, likely due to its recent release[40]. Additionally, few studies have specified the procedures and methods to follow when adopting any AI tools in language instruction[41].

Therefore, this study aimed at the effectiveness of using the Google Assistant Application as an Artificial Intelligence tool in improving Palestinian (BZU and UCAS) EFL students' speaking performance. The questions that guided this research were as follows:

RQ1: Are there any statistically significant differences in (BZU and UCAS) students' speaking performance attributed to the teaching technique (the Google Assistant App)?

RQ2: What are the benefits and challenges of using the Google Assistant App in developing (BZU and UCAS) students' speaking performance based on students' perspectives?

2. Pertinent Studies

The application of new technology to EFL is growing more and more common. Different learning tools have been used for different learning goals. For instance, many educational resources are used to acquire speaking skills. Google Assistant is one of the technological developments that may be used to improve speaking abilities[42]. In this section, previous studies related to the main objective and variables of the current study are displayed.

Zou et al.[43] investigated whether different forms of automatic feedback provided by AI speech assessment systems can aid in the speaking proficiency development of English as a foreign language (EFL) learner. Participants in this study were forty Chinese EFL students. Both qualitative and quantitative data were collected. The findings of the study showed that the majority of participants felt that the input provided by the AI speaking assessment software helped them enhance their speaking abilities.

Additionally, the results showed that their speaking abilities mean scores on the pre-and posttests had significantly improved. Consequently, it is proposed that AI-speaking assessment systems could offer more diverse textual feedback and useful

Sofian et al.[39], through the use of the Google Assistant App, conducted a study that aimed to investigate students' speaking abilities improvement by exposing them to different speaking resources. This research adopted the experimental method to determine whether or not the utilization of the Google Assistant App aids EFL learners in improving their speech abilities. 31 learners in the eleventh grade from Tangerang Selatan's DUA MEI Senior High School participated in the research. Pre-test and post-test results were used to gather the data. Findings indicated that Google Assistant is an effective medium to improve students' speaking skills.

Tzu-Yu and Howard[44] conducted a study that aimed to find out how Google Assistant might help improve ado-

lescent EFL learners' Willingness to Communicate (WTC) and how they view Google Assistant in general. In this research, 112 EFL students in the eighth grade participated in two weeks of Google Assistant language learning exercises. At the start and conclusion of the action, two WTC surveys were given out. The findings showed that Google Assistant greatly improved communicative confidence, decreased speaking nervousness, and substantially promoted WTC in EFL learners. Interview analysis showed that subjects liked interacting with robots and playing games with Google Assistant, which made them feel less nervous and encouraged them to use English for authentic and meaningful conversation. According to the results, the interactions created a less intimidating atmosphere where learners showed greater levels of interest, motivation, and self-confidence, which in turn increased their WTC in the target language.

In his study, Anggara [45] tried to determine whether the Google Assistant App could affect students' ability to pronounce words correctly in the tenth grade at SMK Muhammadiyah Sekampung in East Lampung. The cluster random sample of the study constituted 40 pupils. Results indicated that using Google Assistant had a favorable and substantial impact on the student's ability to pronounce words correctly.

Sing et al. [46] conducted a study that looked into how to use Google Assistant to assist a group of elementary students in Baram, Sarawak, Malaysia who had trouble with reading comprehension exercises. The study first attempted to examine the efficacy of using new emerging technologies, such as AI-enabled virtual assistants like Google Assistant, and to assess their utility in language instruction and learning. The study also looked into the advantages of using Google Assistant in reading comprehension exercises and, to a lesser degree, in other language learning processes in the classroom. The use of Google Assistant as an efficient language learning aid in reading comprehension exercises was discovered to have significant beneficial effects.

Overall, by examining the use of the Google Assistant App in previous studies, this study could shed light on the particular difficulties and requirements faced by Palestinian EFL students, which would be helpful to academics and instructors who usually utilize AI tools to improve EFL learners' linguistic and communicative competencies. Furthermore, both qualitative and quantitative instruments were utilized to collect data which can be considered as an added value to this study.

3. Method

3.1. Design

In the current research, a mixed approach was followed using quantitative and qualitative data collection instruments [47]. Quantitatively, pre-post-speaking tests were implemented before and after the treatment with the participants in a quasi-experimental design for one group [48]. Additionally, qualitative data were collected by conducting focus-group discussions with the participating students after the intervention. As for the treatment, students were asked to record and submit conversational discussions (dialogues) using the Google Assistant Conversation App about assigned themes and topics. It is worth noting that students' speaking performance was assessed using one of the IELTS exams for speaking proficiency before and after the intervention.

3.2. Participants

The participating students were from Birzeit University (BZU) in Ramallah and the University College of Applied Sciences (UCAS) in Gaza. The participating students were enrolled in general English courses in the second semester of the academic year 2022/2023. A total of sixty-six (66) students were selected randomly to participate in this study. These groups were asked to conduct, record and submit conversational dialogues about certain themes using the Google Assistant Conversation App. With regards to the focus-group discussions, (10) participating students from BZU and UCAS were asked voluntarily to participate in group discussions regarding their experience with using this AI-based application in developing their spoken performance.

3.3. Data Collection

Obtaining data was performed by using a pre-post speaking test (IELTS) with the participating students before and after administering the treatment (using the Google Assistant Conversation App). The participants' spoken language was measured in a one-to-one speaking test by the researchers. The spoken sub-skills that were assessed were: *Fluency, Vocabulary, Spoken Grammar, Content and rele-*

vance and Pronunciation. A rubric for evaluation adapted from the Annual Examinations by SPECIMEN (2020) was used (See **Appendices A** and **B**). After that, the results of the pre- and post-oral tests were statistically compared to identify any differences related to the teaching technique (Google Assistant Conversation App). Additionally, the effectiveness of using this application was also measured by conducting focus group discussions with the participants (from BZU and UCAS) through a Zoom meeting.

3.4. Instruments

3.4.1. Pre-Post-Speaking Test

The pre-posttest used in the current study was one of the IELTS exams prepared by the British Council. Students' spoken language was measured in terms of five main sub-skills, which were: *Fluency*, *Vocabulary*, *Spoken Grammar*, *Content and Relevance* and *Pronunciation* in addition to utilizing rubrics developed by SPECIMEN (2020). (See **Appendices A** and **B**).

3.4.2. Focus Group Discussion

In recorded Zoom sessions, participating students' attitudes and perspectives were measured by analyzing the responses of a group of three main questions (and other questions that merged) regarding the effectiveness of utilizing the Google Assistant Application. The questions were mainly related to the benefits and challenges or limitations encountered by the participating students, as follows: **Table 1** displays sample of the questions used in the focus group discussion.

Table 1. Samples of the Questions raised in the Focus Group Discussion.

Questions for Students in the Focus Group Discussion
1-Describe your experience with the Google Assistant App.
2-What are the benefits you noticed on you/your language after using this app.
3-What are the challenges you faced while using the Google Assistant during this experiment.

3.5. Validity and Reliability of the Instruments

3.5.1. Pre-Post Oral Test

Although the validity and reliability of the (IETS) speaking test and rubric of evaluation were stated and validated by the British Council and SPECIMEN (2020) respectively, the content and face validity of the pre-post speaking test and the rubrics were set by the researchers (in the current study) by consulting a jury of experts in the foreign/second language field. Some amendments were suggested which were modified accordingly (See **Appendix A**).

To assess the internal consistency of the test, the test was piloted to a sample of 10 students. Then, the Pearson Correlation Coefficient between the item score and the total score test score, and the corrected item-total correlation between the item score and the total score of the test score were extracted. Results revealed that Pearson Correlation Coefficients between the item score and the total score of the test were between (0.761–0.881) and the corrected item-total correlation ranged between (0.646–0.889). Since the internal consistency coefficients were above the threshold value (0.40), the test was regarded as a valid test [49].

Furthermore, Cronbach's alpha and test-retest coefficients for the test were extracted; results revealed that Cronbach's Alpha Coefficient for the test was (0.89), while, the test-retest coefficient was (0.86). As the reliability coefficients were above the threshold value (0.70), the test was regarded as a reliable test.

Additionally, the inter-rater reliability was achieved by involving two evaluators in the pre-post speaking test, then the overall grade of each student per sub-skill was calculated by counting the average of the grades between the two raters [47].

3.6. Procedures

The procedures in the current study went through different steps as follows:

At first, the included topics for teaching were developed by the researchers based on the course outlines. These topics were divided per month as shown in **Table 2**.

Table 2 displays the four (4) main domains that were selected and included during the experiment. It is worth noting that these topics were selected based on students' themes and units included in the course outlines.

Additionally, with the start of the second semester

Table 2. The Included Topics per Month.

March/2023	April/2023	May/2023	June/2023
the Environment/ - Tourism	- Customs and Traditions Or - Preserving Animals	- Transport: Cars and Driving - Traffic Congestions	- Health and Fitness/ (sports)

(March/2023), students were given an orientation about the experiment and how to use the Google Assistant App. Additionally, the pre-speaking test was conducted.

- During the semester (course), students, at the end of each module/unit, were asked to record and submit an audio dialogue or conversation using this app. These recordings had to be uploaded via the Moodle platform.
- In June/2023, the speaking post-speaking test and the focus group discussion via a Zoom meeting were administered.

3.7. Data Analysis

Quantitative data that emerged from the pre-post speaking test were analyzed using the Statistical Package for the Social Sciences Program (SPSS version 23) to answer the research's first question. In other words, A paired samples t-test was conducted to evaluate the effectiveness of a Google Assistant Application usage as an artificial intelligence tool in improving students' speaking performance overall and five speaking skills.

As for the qualitative data, the content analysis of students' responses in the focus group discussion was analyzed using the latent analysis, where codes are grouped into categories and then themes [49], regarding the benefits and chal -lenges of utilizing Google Assistant.

4. Findings

In respect of the first question regarding having any statistically significant differences in students' speaking performance attributed to the Google Assistant App, **Table 3** depicted the means, standard deviations, and skewness coefficients of the pre-/post-test scores in the overall five speaking skills: (Fluency and Interaction, Vocabulary, Spoken Grammar, Content and Relevance, and Pronunciation).

Table 3 shows that the post-test scores of the research subjects are higher than the mean scores of their pre-test scores in the five and overall speaking skills (see **Figure 1**). Furthermore, the absolute values of skewness coefficients of the pre-/post-test scores in the five and overall speaking skills were less than (1), as such, the distribution of pre-/post-test scores in the five and overall speaking skills approached normal [49].

Figure 1 below visually displays the improvement that occurred in students' speaking sub-skills between the pre-and post-test.

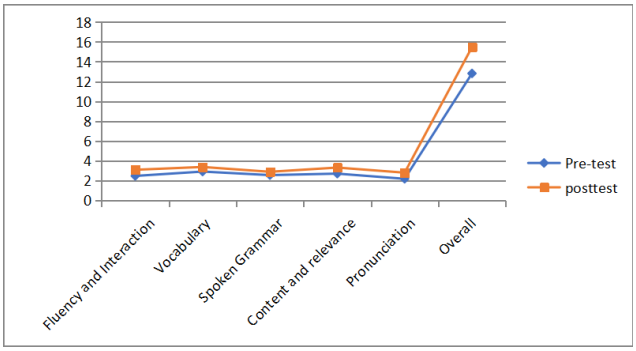

Figure 1. The Means and Standard Deviations of the Pre-/post-test Scores in the Overall and Five Speaking Skills.

Table 3. The Means, Standard Deviations, and Skewness Coefficients of the Pre-/post-test Scores in the Overall and Five speaking skills.

Sub-Skill	Pre-Test			Post-Test		
	Mean	Standard Deviation	Skewness	Mean	Standard Deviation	Skewness
Fluency and Interaction	2.47	0.76	−0.877	3.09	0.87	−0.366
Vocabulary	2.91	0.88	−0.069	3.37	0.79	−0.393
Spoken Grammar	2.55	0.82	−0.817	2.89	0.79	0.962
Content and relevance	2.70	0.70	−0.598	3.31	0.56	0.960
Pronunciation	2.18	0.77	−0.909	2.80	0.94	−0.382
Overall	12.81	3.30	−0.583	15.46	3.09	−0.204

A paired samples t-test was conducted to evaluate the effectiveness of a Google Assistant Application usage as an artificial intelligence tool in improving students' speaking performance overall and five speaking skills, as shown in **Table 4** below.

As displayed in **Table 4**, the results showed that the mean of the post-test (After the intervention) (Mean = 15.46, SD = 3.09) was significantly greater than the mean of the pretest (Before) (Mean = 12.81, SD = 3.30, t(66) = −12.764, <0.01) in the overall skills. The standardized effect size index, d, was 1.572 (Very Large effect size). In terms of *Fluency and Interaction skill*, the findings indicated that the mean of the posttest (After) (Mean = 3.08, SD = 0.87) was significantly greater than the mean of the pretest (Before) (Mean = 2.47, SD = 0.76), t(66) = −9.565, <0.01. The standardized effect size index, d, was (1.178) (very large effect size). Regarding the Vocabulary *skill*, the results indicated that the mean of the posttest (After) (Mean = 3.37, SD = 0.79) was significantly greater than the mean of the pretest (Before) (Mean = 2.91, SD = 0.88, t(66) = −6.853, <0.01). The standardized effect size index, d, was 0.844 (large effect size). As for the *Spoken Grammar skill*, on the other hand, the results indicated that the mean of the posttest (After) (Mean = 2.89, SD = 0.79) was significantly greater than the mean of the pretest (Before) (Mean = 2.55, SD = 0.82, t(66) = −4.688, <0.01). The standardized effect size index, d, was 0.577 (Medium effect size). The results related to the *Content and Relevance skill* indicated that the mean of the posttest (After) (Mean =3.31, SD = 0.56) was significantly greater than the mean of the pretest (Before) (Mean = 2.70, SD = 0.70), t(66) = −5.760, <0.01. The standardized effect size index, d, was 0.711 (large effect size). Additionally, it was displayed in the results that the mean of the posttest (After) regarding the *Pronunciation skill* (Mean = 2.80, SD = 0.94) was significantly greater than the mean of the pretest (Before) (Mean = 2.18, SD = 0.77), t(66) = −7.709, <0.01. The standardized effect size index, d, was 0.949 (Very Large effect size).

Table 4. Summary Results of paired T-test.

Sub-Skill	Time	Mean	Std	t	Df	P-Value	Effect Size (d)
Fluency and Interaction	Pre-test Post-test	2.47 3.08	0.76 0.87	−9.565	66	0.00	1.178
Vocabulary	Pre-test Post-test	2.91 3.37	0.88 0.79	−6.853	66	0.00	0.844
Spoken Grammar	Pre-test Post-test	2.55 2.89	0.82 0.79	−4.688	66	0.00	0.577
Content and relevance	Pre-test Post-test	2.70 3.31	0.70 0.56	−5.760	66	0.00	0.711
Pronunciation	Pre-test Post-test	2.18 2.80	0.77 0.94	−7.709	66	0.00	0.949
Overall	Pre-test Post-test	12.81 15.46	3.30 3.09	−12.764	66	0.00	1.572

Overall, the results showed that the mean of the posttest was significantly greater than the mean of the pretest in the overall skills. Based on the effect size values above, it can be concluded that the highest effects of using the Google Assistant Application were on *Fluency and Interaction*, followed by *Pronunciation, Vocabulary, Content and Relevance*, and *Spoken Grammar* respectively.

In respect of the results regarding the second question in the study concerning the benefits and challenges of using the Google Assistant App in developing students' speaking performance, it can be stated based on the results inducted from content analyzing the focus group discussion with participating students in the current study, multiple benefits, as well as some challenges, were extracted.

As for the benefits of using the Google Assistant Application based on Students' Perspectives, three main domains were inducted as follows.

4.1. Language Practice and Resources

Based on an analysis of the student's responses throughout the focus group discussion, it can be concluded that the participating students gained various benefits from using the Google Assistant App. All ten (10) students (100%) regarded this application as a valuable tool that offers language practice and enhances their speaking performance and sub-skills, including pronunciation, accent, vocabulary, and knowledge about the given topics. One of the participating students stated, "*This app is genuinely helpful, especially when we pose the same question repeatedly; it provides us with diverse information, and even in simple greetings, its responses vary*."

Another student indicated, *"When I posed a question to Google Assistant and mispronounced a word, it responded with the correct pronunciation, allowing me to promptly fix my mistake and repeat it accurately... this was incredibly beneficial."* In terms of pronunciation, a different participant shared, *"While hearing the native speaker's accent and the pronunciation of the vocabulary items, I determined to imi -tate them. This brings about a significant change in my way of pronouncing many of the learned words"*. It was also con-firmed by some participating students that they started using this app frequently to learn about new topics and language aspects. It was stated by a student, " *I feel this app knows me, when I say Hi, for instance, it responds with my name as it knows me. I even started using it daily for different purposes*".

4.2. Engaging and Motivating Experience

Google Assistant was also characterized as a handy tool by the majority of participants (90%). It was also described as a user-friendly application that is not only enjoyable and free but also suitable for all proficiency levels. One student pointed out, "*This application can encourage any student to use it can give you answers without judging your language*". Another participant affirmed, "*This application helped me in* formulating questions *and constructing proper sentences. I used to feel anxious about asking, but this app supported my confidence and reduced my anxiety*." They further added, "*I appreciate the immediate responses provided by this application. It helps refine our accents indirectly*." Another aspect highlighted by the students pertained to the utilization of such applications for discussing topics relevant to their context, such as tourist sites in Palestine. This approach not only stimulated their motivation but also made the learning process more enjoyable.

4.3. Self-Directed Learning Experience

One of the benefits gleaned from the responses of participating students was associated with their experiences while using this app during the experiment. Six students (60%) described feeling a sense of independence when using the application. They also emphasized how its usage empowered them to enhance their language proficiency at their own pace, fostering a sense of autonomy. As expressed by a participating student, "*Initially, I was quite confused and overwhelmed when I began using this application. I had to record a dialogue and upload it via Moodle it was really hectic, Yet when I practiced many times and recorded the best version of the dialogue with this app I felt really I experienced a profound sense of accomplishment."*

Regarding the challenges students encountered, while using the Google Assistant Application, two main challenges were identified as follows:

4.4. Accessibility and Connectivity Issues

It was asserted by nine participating students (90%) that one of the main challenges that they confronted was related to the accessibility of the Google Assistant App. It was indicated that this application was restricted to certain Palestinian regions and was not compatible with all types of smart devices and phones. Additionally, the functionality of this application relied on stable internet connectivity. Thus, students who did not have access to the internet might not have been able to use this application. It was asserted by one of the students "*I tried to install this application on my iPhone (iOS) but I could not, I asked all my family members to try to install it, but they could not Eventually, I had to borrow a friend's mobile phone on campus to complete the speaking task*". Another student confirmed, "*One of the problems that I encountered pertained to the slow response that the Google Assistant App provided when the internet was unstable.. it was a real problem because we were asked to record a 5-minute discussion*".

4.5. Technical Problems and Pronunciation Recognition

It was confirmed by most of the participating students (80%) in the focus group discussion that they encountered technical glitches and issues with pronunciation recognition while using the Google Assistant App. It was pointed out by one of the participants *" At times, this application changes the language or responds/ provides written responses (articles) or videos instead of spoken words .."*. Another participating student stated, " *We had to repeat the questions over and over to have a response; additionally the application does not address all questions*". In respect of pronunciation recognition, it was asserted," *This application does not identify our pronunciation accurately and easily sometimes, we tended to repeat and rephrase the same question multiple times to have an answer*". One of the students also said " *This problem made me search for other alternatives using different words and sentence forms conveying the same message*".

5. Discussion

Based on the aforementioned results, it can be noticed that a significant improvement/advancement occurred in students' overall speaking performance and sub-skills. The results showed that the mean of the post-test (After the intervention) (Mean = 15.46, SD = 3.09) was significantly greater than the mean of the pretest (Before) (Mean = 12.81, SD = 3.30, $t(66) = -12.764$, <0.01) in the overall skills. The most notable impact of utilizing the Google Assistant Application was observed in *Fluency and Interaction*, followed by *Pronunciation*, *Vocabulary*, *Content and Relevance*, and *Spoken Grammar* respectively.

This result can be attributed to the range of activities that such an AI-based app facilitates. As the participating students were tasked with recording discussions using the Google Assistant app, they were engaged in simulated conversations, discussions and role plays. The repetitive nature of these interactions and dialogues likely contributed to the development of their fluency and interactive abilities, as they practiced crafting sentences and questions repeatedly to elicit accurate responses. Additionally, the capacity of this app to promptly correct mispronunciations may have led to an improvement in pronunciation as students recorded their speaking tasks repeatedly.

Regarding Spoken Grammar and Content and Relevance skills, students demonstrated improvement in formulating responses influenced by accurately receiving model answers. The app provided them with definitions, examples, videos, and more, thereby potentially broadening their understanding of spoken grammar. Moreover, the upswing in students' speaking performance could also be ascribed to Google Assistant's provision of intensive language exposure within a meaningful context that highly triggers language acquisition, which aligns with Krashen's theory of language acquisition[30].

Using technology and AI applications could also have had a positive impact on students' speaking proficiency, as such tools can provide students with opportunities to practice the foreign language in a simulated and augmented context. Consequently, students can refine their speaking abilities at their pace, especially when they can access this technology regularly and receive personalized feedback[13, 14, 16–18, 50, 51].

Concerning the benefits of the Google Assistant application, as perceived by students in focus group discussions, this app was regarded as a multifaceted tool capable of achieving numerous benefits. Primarily, as previously mentioned, this AI-based application offered students intensive and cost-free opportunities to practice the language through simulated conversations, role plays and discussions. Students confirmed that the use of this AI application has notably improved their spoken performance, including aspects such as pronunciation, vocabulary, interaction, and understanding of discussion themes or topics. This alignment with the earlier pre-post results emphasizes the improvement in students' spoken performance before and after using this technology.

Google Assistant was also described as a beneficial language resource; it offered students definitions, examples, videos, and more. According to the participating students after using this AI app, it was described as an engaging and motivating tool. This can be referred to as a non-judgmental and non-intimidating approach while offering corrections Thus, students found using this tool enjoyable, as it afforded them the chance to practice the foreign language with reduced anxiety and increased confidence. These affective variables hold significance as factors that can either hinder or facilitate the acquisition of foreign or second languages. Students with lower levels of anxiety and greater motiva-

tion tend to witness faster improvement in their language proficiency compared to anxious and demotivated learners, particularly when they are immersed in authentic contexts using technological tools [29, 31]. These findings came in harmony with previous studies (i.e., [40, 43]; and Sofian et al. [39]) that demonstrated the positive impact of using AI tools and applications on enhancing students' speaking proficiency.

An additional benefit that students may have obtained from using Google Assistant is the promotion of self-regulation skills. This technology likely empowered students to have greater control over the development of their speaking performance. Students asserted that they were able to use this application at their own pace and receive feedback as well as corrections in a non-judgmental and off-offensive method. This dynamic may have granted students increased autonomy in their learning, fostering the development of self-regulation in adult college students who are empowered to learn autonomously. Self-regulation is recognized as a fundamental competency for adult students engaged with online learning and technology to enable them to achieve self-determination [2, 3, 33, 51].

While the participating students acknowledged the benefits of using the Google Assistant application, their responses also highlighted certain challenges and limitations. One of the major concerns emphasized by the participants was the app's accessibility. It was noted that the Google Assistant application was not entirely accessible, as it lacked support for all types of smart devices and was unavailable in all regions. Moreover, its reliance on stable internet connectivity presented an obstacle, possibly depriving some students of equal opportunities to utilize and benefit from such technological resources. Accordingly, this may not have achieved inclusion and equity in education which are two pillars in education based on the UNESCO report [52].

Another challenge encountered by students pertained to technical issues and difficulties with pronunciation recognition while using the application. Students encountered instances of glitches, delayed responses, and even instances where no answers were generated. Additionally, they found themselves needing to repeat the same questions several times to prompt and record responses accurately. It is important to note that the incorporation of AI-based technology inevitably accompanies such failures and glitches, as technology cannot entirely replicate human actions and behavior. Thus, anticipation of technical challenges is essential, as these issues underscore the primary obstacles that humans need to consider when relying on AI-based technology [50].

5.1. Conclusions and Recommendations

Upon adjacent analysis of the previous results, it can be concluded that using the Google Assistant app as a voice-controlled technique to promote students' spoken performance has the potential to enhance students' speaking performance due to different factors as follows:

- This application can allow students to practice the language at their own pace. It can also supply them with a wide range of information about their topics, which can facilitate language acquisition, fluency and general language proficiency.
- This AI-based tool can also match the characteristics of adult learners (college students) who need to gain more power over their learning as self-regulated students and can improve their speaking performance autonomously, especially due to personalized feedback.
- Using the Google Assistant application can also be engaging as it can provide learners with personalized feedback in an off-offensive mode. Thus, this can foster their intrinsic motivation, improving their general language proficiency.
- Using this application may not achieve inclusion and equity in education due to the accessibility and internet connectivity. It may cause some confusion regarding the glitches and technical failure may occur. Thus students need to be introduced to these limitations before using such tools.
- To boost the benefits of the Google Assistant app, it can be integrated into a comprehensive language learning program that combines real-life communication opportunities and encourages more contextualized language.
- Future research can be recommended and encouraged in light of the findings of the current study by including a larger number of participants divided into control and experimental groups, in addition to comparing the benefits or challenges of using more than one AI tool in promoting students' speaking proficiency.

5.2. Limitations

The scope of the findings of the present study is confined to some limitations. First, this study was conducted to investigate the effect of using one of the AI tools (the Google Assistant App) on BZU and UCAS students' speaking performance, in addition to examining the benefits and challenges of using this app based on students' perspectives. Second, the participants were sixty-six (66) students from BZU and UCAS in Palestine, and the study was conducted in the second semester of the academic year 2022/2023. Although a mixed (Qualitative and quantitative) approach in data collection using pre-post tests and focus-group discussions, the pre-and post-test did not include a control group to provide a deeper scope for comparison.

Author Contributions

Conceptualization, R.Q. and M.T.; methodology: R.Q., A.E. and M.I.; formal analysis, R.Q., A.E., investigation, R.Q., A.E. and M.I.; resources, R.Q., M.T.; data curation, R.Q., A.E. and M.I.; writing—original draft preparation, R.Q., writing—review and editing, R.Q., M.T.; funding acquisition, M.T. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Informed consent was obtained from all participants involved in the study.

Data Availability Statement

The data supporting the findings of this study are available within the article and its supplementary materials. Additional data may be provided upon reasonable request from the corresponding author.

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Conflicts of Interest

The authors declare no conflict of interest.

Appendix A. Pre- and Post-Speaking Test

IELTS Speaking Test

In the Speaking test, you will discuss with an examiner. It will be interactive and as close to a real-life situation.

Time: The Speaking test is 11–14 minutes long and is in three parts.

Part 1 - You will answer questions about yourself and your family.
Part 2 - You will speak about a topic.
Part 3 - You will have a longer discussion about the topic introduced in Part 2.

IELTS Speaking test - part 1

In part 1 of the Speaking test, the examiner will introduce him or herself and ask general questions on familiar topics. The examiner will ask you to confirm your identity. He or she will then ask general questions on familiar topics such as home, family, work, studies and interests. Part 1 of the test will last 4–5 minutes.

Part 1: questions

Let's talk about your hometown or village:

- what kind of place is it?
- what's the most interesting part of your town/village?
- what kind of jobs do the people in your town/village do?
- would you say it's a good place to live? (why?)

Let's move on to talk about accommodation:

- tell me about the kind of accommodation you live in.
- how long have you lived there?
- what do you like about living there?
- what sort of accommodation would you most like to live in?

IELTS Speaking test - part 2

In the IELTS speaking part 2 test you will be given a task card on a particular topic, and this will include key points that you should talk about.

This section of the Speaking test gives you the opportunity to speak for longer on a topic. You will be given one minute to prepare to talk about the topic on the task card. A pencil and paper will be provided for you to make notes.

You will have to talk for 1–2 minutes, and then the examiner will ask you one or two questions on the same topic. Part 2 takes 3–4 minutes in total.

Part 2: candidate task card

Describe something you own which is very important to you. You should say:

- where you got it from
- how long you have had it
- what you use it for; and
- explain why it is important to you.

You will have to talk about the topic for 1 to 2 minutes. You have one minute to think about what you're going to say. You can make some notes to help you if you wish.

IELTS Speaking test - part 3

In part 3 of the Speaking test, the examiner will ask further questions which are connected to the topics discussed in part 2.

This part of the test is designed to give you the opportunity to talk about more abstract issues and ideas. It is a two-way discussion with the examiner and will last 4–5 minutes.

Part 3: a Two-way discussion

Let's consider first of all how people's values have changed.

- What kind of things that gives status to people in your country?
- Have things changed since your parents' time?

Finally, let's talk about the role of advertising.

- Do you think advertising influences what people buy?

Adopted from:

https://takeielts.britishcouncil.org/take-ielts/prepare/free-ielts-practice-tests/speaking

Appendix B. Evaluation Rubrics

Task 1 ……/20

Student's Name _____ Date: _____

Categories	5 Marks	5 Marks	5 Marks	5 Mark
Fluency and Interaction	Communicates and interacts more fully and with some pauses and hesitations (0–2) which do not interfere with comprehension.	Speaks slowly, using a few hesitations and pauses (3–4) to search for words.	Speaks slowly, using hesitation (5–6) to rephrase and search for vocabulary.	Communication is inadequate and speech is very often affected by repetitions, pauses (more than 7) and self-correction.
	4/	3/	2/	1/
Vocabulary	**5 Marks**	**5 Marks**	**5 Marks**	**5 Mark**
	Uses advanced vocabulary and phrases to be more specific in expressing meaning appropriate to the context.	Uses basic vocabulary and phrases related to the topic, activities, and people.	Uses basic vocabulary related to the topic with some inappropriate use of lexical items.	Uses a very limited range or inappropriate vocabulary to talk about the topic.
	4/	3/	2/	1/

Categories	5 Marks	5 Marks	5 Marks	5 Mark
	5 Marks	**5 Marks**	**5 Marks**	**5 Mark**
Spoken grammar	Uses a range of grammatical structures and construct simple and complex sentence structures linked with a range of connectors.	Uses basic grammatical structures and constructs simple sentence structures.	Expresses oneself, with basic errors (such as: /s/ third person, /s/plural, present/ past agreement)	Shows insufficient control of simple grammatical forms and structures are inaccurate.
	4	3/	2/	1/
Content and Relevance	**5 Marks** Task is achieved in full. Reply is relevant.	**5 Marks** Task is achieved. Choice of utterances is mostly relevant.	**5 Marks** Task is partially achieved. Choice of utterances is a bit relevant.	**5 Mark** Task is not achieved. Choice of utterances is irrelevant.
	4/	3/	2/	1/
Pronunciation, intonation and stress	**5 Marks**	**5 Marks**	**5 Marks**	**5 Mark**
	Speech is consistently clear and intelligible, using the appropriate intonation and stress to express the desired meaning (0–1 mispronunciations).	Speech is generally clear and intelligible, with some influence of first language intonation and stress patterns, but meaning is generally achieved (2–3 mispronunciations).	Speech is a bit clear, with much interference of first language intonation and stress patterns (4–5 mispronunciations).	Mispronunciations in speech interfere considerably with meaning, and intonation and stress are extremely influenced by the first language (more than 6 mispronunciations).
	4/	3/	2/	1/
Total (20 Marks)				

Comments:

References

[1] Williams, R., Park, H.W., Oh, L., et al., 2019. PopBots: Designing an artificial intelligence curriculum for early childhood education. In Proceedings of the AAAI Conference on Artificial Intelligence. 33(1), 9729–9736. DOI: https://doi.org/10.1145/3306618.3306753

[2] Lin, P., Van Brummelen, J., Lukin, G., et al., 2020. Zhorai: Designing a conversational agent for children to explore machine learning concepts. Proceedings of the AAAI Conference on Artificial Intelligence. 34(9), 13381–13388. DOI: https://doi.org/10.1609/aaai.v34i09.7061

[3] Nan, J., 2020. Research of Application of Artificial Intelligence in Preschool Education. Journal of Physics: Conference Series. 1607, 012119. DOI: https://doi.org/10.1088/1742-6596/1607/1/012119

[4] Ge, D., Wang, X., Liu, J., 2021. A Teaching Quality Evaluation Model for Preschool Teachers Based on Deep Learning. International Journal of Emerging Technologies in Learning. 16(3), 127–143. DOI: https://doi.org/10.3991/ijet.v16i03.20471

[5] Kewalramani, S., Kidman, G., Palaiologou, I., 2021. Using Artificial Intelligence (AI)-Interfaced Robotic Toys in Early Childhood Settings: A Case for Children's inquiry literacy. European Early Childhood Education Research Journal. 29(5), 652–668. DOI: https://doi.org/10.1080/1350293X.2021.1968458

[6] Russell, S.J., Norvig, P., 2016. Artificial intelligence: A modern approach. Prentice Hall: NJ, USA. Available from: https://zoo.cs.yale.edu/classes/cs470/materials/aima2010.pdf

[7] Solanki, S.L., Pandrowala, S., Nayak, A., et al., 2021. Artificial intelligence in the perioperative management of major gastrointestinal surgeries. World Journal of Gastroenterology: WJG. 27(21), 2758–2770. DOI: https://doi.org/10.3748/wjg.v27.i21.2758

[8] Knapp, S., 2006. Artificial intelligence: Past, present, and future. VOX of Dartmouth.

[9] Cordeschi, R., 2007. AI Turns Fifty: Revisiting its Origins. Applied Artificial Intelligence. 21, 259–279. DOI: https://doi.org/10.1080/08839510701252304

[10] Roll, I., Wylie, R., 2016. Evolution and Revolution in Artificial Intelligence in Education. International Journal of Artificial Intelligence in Education. 26(2).

[11] Hinojo-Lucena, F, Aznar-Díaz, I., Cáceres-Reche, M., et al., 2019. Artificial Intelligence in Higher Education: A bibliometric study on its impact in the scientific literature. Education Sciences. 9(1), 51. DOI: https://doi.org/10.3390/educsci9010051

[12] Zawacki-Richter, O., Marín, V.I., Bond, M., et al., 2019. Systematic Review of Research on artificial intelligence applications in higher education–where are the educators? International Journal of Educational Technology in Higher Education. 16(1), 1–27. DOI: https://doi.org/10.1186/s41239-019-0171-0

[13] Della-Ventura, M., 2017. Creating Inspiring Learning Environments by Means of Digital Technologies: A Case Study of the Effectiveness of WhatsApp in Music Education. EAI Endorsed Transactions on e-Learning. 4(4), 1–9. DOI: https://doi.org/10.4108/eai.26-7-2017.152906

[14] Wang, Y.J., 2017 Discussion on Artificial Intelligence and Future Business Model. China Journal of Commerce. 17, 132–133.

[15] Chan, K., Zary, N., 2019. Applications and Challenges of Implementing Artificial Intelligence in Medical Education: Integrative Review. JMIR Medical Education. 5(1), 1–16. DOI: https://doi.org/10.2196/13930

[16] Rodrigues, F., Oliveira, P., 2014. A System for Forma-

tive Assessment and Monitoring of Students' Progress. Computers & Education. 76. DOI: https://doi.org/10.1016/j.compedu.2014.03.001

[17] Marsh, J.A., 2017. The Internet of Toys: a Posthuman and Multimodal Analysis of Connected Play. Teachers College Record, Columbia University. 119, 1–32.

[18] Arnott, L., Palaiologou, I., Gray, C., 2018. Digital Devices, Internet-enabled Toys and Digital Games: The changing nature of young children's learning ecologies, experiences and pedagogies. British Journal of Educational Technology. 49(5).

[19] Chen, X., Zou, D., Xie, H., et al., 2022. Two Decades of Artificial Intelligence in Education: Contributors, Collaborations, Research Topics, Challenges, and Future Directions. Educational Technology & Society. 25(1), 28–47.

[20] Brynjolfsson, E., Mitchell, T., 2017. What Can Machine Learning Do? Workforce Implications. Science. 358(6370), 1530–1534. DOI: https://doi.org/10.1126/science.aap8062

[21] Gori, M., 2017. Machine Learning: A Constraint-based Approach. Morgan Kaufmann: Burlington, MA.

[22] Karmani, P., Chadio, A., Korejo, I., et al., 2019. A Review of Machine Learning for Healthcare Informatics Specifically Tuberculosis Disease Diagnostics: First International Conference, INTAP 2018; Bahawalpur, Pakistan; 23–25 October 2018. pp. 50–61. DOI: https://doi.org/10.1007/978-981-13-6052-7_5

[23] Kumari, R., 2021. Introduction to Deep Learning and its Applications. Analytic Steps. Available from: https://www.analyticssteps.com/blogs/introduction-deep-learning-and-its-applications (cited 11 October 2022).

[24] Katz, S., 2021. AI Improving Assistant Conversations. Tech Explore. Available from: https://techxplore.com/news/2021-04-ai-google-conversations.html (cited 11 October 2022).

[25] Chaney, A.L., Burk, T.L., 1998. Teaching Oral Communication in Grades K-8. Allyn & Bacon: Boston.

[26] Thornbury, S., 2005. How to Teach Speaking. Longman Pearson.

[27] Brown, H.D., 2001. Teaching by Principles: An Interactive Approach to Language Pedagogy, 2nd ed. Addison Wesley Longman: New York, NY.

[28] Abidin, A., Al-Bawaleez, M., Abidin, S., et al., 2022. Analysis of EFL Learners' Language Proficiency Development Across Different Social Media Platforms. Theory and Practice in Language Studies. 12(9),1756–1761, DOI: https://doi.org/10.17507/tpls.1209.07

[29] Omaggio, A., 2001. Teaching Language in Context, 3rd ed. Heinle & Heinle: Boston.

[30] Krashen, S.D., Terrell, T.D., 1983. The Natural Approach: Language Acquisition in the Classroom. Pergamon: Oxford.

[31] Wadsworth, B.J., 1996. Piaget's Theory of Cognitive and Affective Development: Foundations of Constructivism. Longman Publishing: London.

[32] Hurlock, E., 2010. Child Development. McGraw: New York, NY.

[33] Vartiainen, H., Tedre, M., Valtonen, T., 2020. Learning Machine Learning with Very Young Children: Who is teaching whom? International Journal of Child-Computer Interaction. 25, 100182.

[34] Garg, T., 2020. Artificial intelligence in medical education. The American Journal of Medicine. 133(2), 68. DOI: https://doi.org/10.1016/j.amjmed.2017.10.035

[35] Fomichov, V., Fomichova, O., 1995. The Artificial Intelligence Theory and Highly Effective Methods of Teaching Young Children Foreign Languages. Cybernetica. 38(4), 321–344.

[36] Canamero, L., Lewis, M., 2016. Making new "new AI" friends: Designing a social robot for diabetic children from an embodied AI perspective. International Journal of Social Robotics. 8(4), 523–537. DOI: https://doi.org/10.1016/j.procs.2018.08.233

[37] Florea, S.R., 2019. Artificial Intelligence and Education. In Proceedings of the 22nd International Conference on Control Systems and Computer Science (CSCS), IEEE (2019); Bucharest, Romania; 28–30 May 2019. pp. 381–382.

[38] Zovko, V., Gudlin, M., 2019. Artificial Intelligence as a Disruptive Technology in Education. In Proceedings of the 9th International Conference the Future of Education (2019); Florence, Italy; 27–28 June 2019. Available from: https://conference.pixel-online.net/files/foe/ed0009/FP/5803-ENT3951-FP-FOE9.pdf

[39] Sofian, M., Raisya, H., Junor, S., et al., 2022. Speaking To Devices: Can We Use Google Assistant To Foster Students' Speaking Skills? JOLLT Journal of Languages and Language Teaching. 10(4), 570. DOI: https://doi.org/10.33394/jollt.v10i4.5808

[40] Lynley, M., 2016. Google unveils Google Assistant, a virtual assistant that's a big upgrade to Google Now. TechCrunch. AOL. Retrieved in May, 2023.

[41] Su, J., Yang, W., 2022. Artificial intelligence in early childhood education: A scoping review. Computers and Education: Artificial Intelligence. 3(2022), 1–14. DOI: https://doi.org/10.1016/j.caeai.2022.100049

[42] Underwood, J., 2021. Speaking to machines: motivating speaking through oral interaction with intelligent assistants. In: Beaven, T., Rosell-Aguilar, F. (Eds.). Innovative language pedagogy report. pp. 127–132. DOI: https://doi.org/10.14705/rpnet.2021.50.1247

[43] Zou, B., Du, Y., Wang, Z., et al., 2023. An investigation into artificial intelligence speech evaluation programs with automatic feedback for developing EFL learners' speaking skills. SAGE Open. 1–9. DOI: https://doi.org/10.1177/21582440231193818

[44] Tzu-Yu, T., Howard, C., 2020. The impact of Google

Assistant on adolescent EFL learners' willingness to communicate, Interactive Learning Environments. 1–19. DOI: https://doi.org/10.1080/10494820.2020.1841801

[45] Anggara, D., 2019. The Influence of Using Google Assistant on the Students' Pronunciation Ability of the Tenth Grader of Smk Muhammadiyah Sekampung East Lampung[Unpublished Master's Thesis]. Tarbiyah and Teacher Training Faculty, English Education Department. Lampung Timur. Available from: https://repository.metrouniv.ac.id/id/eprint/394/1/SKRIPSI%20DIKI%20ANGGARA%20%28Student%20Number.1501070164%29%20-%20Perpustakaan%20IAIN%20Metro.pdf

[46] Sing, P., Embi, M., Hashim, H., 2019. Ask the Assistant: Using Google Assistant in Classroom Reading Comprehension Activities. International Journal of New Technology and Research (IJNTR). 5(7), 39–43. Available from: https://www.researchgate.net/publication/334820962

[47] Creswell, J.W., 2014. Educational Research: Planning, Conducting and Evaluating Quantitative and Qualitative Research, 4th ed. Pearson: Harlow.

[48] Fraenkel, J., Wallen, N., Hyun, H., 2018. How to Design and Evaluate Research in Education, 10th ed. McGraw-Hill: New York, NY.

[49] Leech, N.G., Barrett, K.C., Morgan, G.A., 2011. SPSS for intermediate statistics: Use and interpretation, 4th ed. Lawrence Erlbaum Associates, Inc.: Mahwah, NJ.

[50] Qassrawi, R., 2023. Education 3.0 underpinned with the heutagogical approach for a smooth shift to distance learning in higher education. International Journal of Education and Practice. 11(1), 1–13. DOI: https://doi.org/10.18488/61.v11i1.3238

[51] Qassrawi, R., Al Karasneh, S., 2023. Benefits of Facebook usage (as a Web 2.0 application) in foreign language instruction in higher education: A meta-analysis study. Cogent Arts & Humanities. 10(1). DOI: https://doi.org/10.1080/23311983.2023.2185447

[52] UNESCO. Director-General, 2017- (Azoulay, A.)., 2017. Programme and meeting document. (ERI-2018/WS/1 REV.1). UNESCO.